

## CLAIMS

What is claimed is:

1. A method, comprising:
  - obtaining historical auction data;
  - determining, from the historical auction data, a first parameter that is a function of a joint bid distribution and a density function related to the joint bid distribution;
  - selecting a bidder;
  - obtaining a value distribution for the selected bidder; and
  - solving an equation that includes the first parameter and the selected bidder's value distribution, and not the value distribution of other bidders, to compute a bid value associated with the selected bidder for a given bid.
2. The method of claim 1 wherein solving the equation comprises solving an ordinary differential equation that comprises a probability value distribution associated with the selected bidder and the derivative of the probability value distribution.
3. The method of claim 1 wherein solving the equation comprises solving
$$\frac{d \log F_k(\varphi_k(b))}{db} + \frac{1}{\varphi_k(b) - b} = \Psi(b) \text{ where } \Psi(b) \text{ comprises the first value, } b \text{ is a bid, } \varphi_k(b) \text{ is the selected bidder's value distribution, } k \text{ is an index identifying the selected bidder, and } F(\varphi_k(b)) \text{ is the probability value distribution for the selected bidder.}$$
4. The method of claim 1 wherein determining a first parameter comprises computing a ratio of the density function to the joint bid distribution.
5. The method of claim 1 further comprising repeating the acts of selecting a bidder, obtaining a probability value distribution for the selected bidder and solving the equation for additional bidders.

6. A system, comprising:
  - a processor; and
  - memory containing software executable by said processor;
  - wherein, by executing said software, said processor computes a ratio of an estimate of a density function to an estimate of a joint bid distribution, permits a bidder to be selected, obtains a probability value distribution for the selected bidder, and solves an ordinary differential equation that includes the selected bidder's probability value distribution, and not the probability value distribution of other bidders, to compute a bid value associated with the selected bidder.
7. The system of claim 6 wherein the ordinary differential equation comprises the ratio.
8. The system of claim 6 wherein the processor solves the ordinary differential equation multiple times, each time for a different selected bidder and each time without using probability value distributions associated with other bidders.
9. The system of claim 6 wherein the equation comprises:
$$\frac{d \log F_k(\varphi_k(b))}{db} + \frac{1}{\varphi_k(b) - b} = \Psi(b) \text{ where } \Psi(b) \text{ comprises the ratio, } b \text{ is a bid,}$$

$\varphi_k(b)$  is the selected bidder's value distribution,  $k$  is an index identifying the selected bidder, and  $F(\varphi_k(b))$  is the probability value distribution for the selected bidder.
10. The system of claim 6 wherein computing the ratio comprises obtaining historical bid data.
11. The system of claim 6 wherein the processor determines a reserve price based on the computed bid value.

12. A system, comprising:

means for determining a ratio of an estimate of a density function to an estimate of a joint bid distribution;

means for selecting a bidder;

means for obtaining a probability value distribution for the selected bidder;  
and

means for evaluating an ordinary differential equation that includes the selected bidder's probability value distribution, and not the probability value distribution of other bidders, to compute a bid value associated with the selected bidder.

13. The system of claim 12 further including means for obtaining historical bid data to be used by the means for determining the ratio.

14. A computer readable storage medium storing instructions that when executed by a processor cause the processor to determine a bid value for a bidder of a action, said instructions comprising:

an instruction usable to obtain previously acquired auction information;

an instruction usable to determine, from the previously acquired auction information, a first parameter that is a function of a joint bid distribution and a density function related to the joint bid distribution;

an instruction usable to determine a bidder;

an instruction usable to obtain a value distribution for the determined bidder; and

an instruction usable to solve an equation that includes the first parameter and the determined bidder's value distribution, and not the value distribution of other bidders, to compute a bid value associated with the determined bidder for a given bid.

15. The storage medium of claim 14 wherein the instruction usable to solve the equation comprises an instruction usable to solve an ordinary differential equation.

16. The storage medium of claim 15 wherein the instruction usable to solve the equation comprises an instruction usable to solve

$$\frac{d \log F_k(\varphi_k(b))}{db} + \frac{1}{\varphi_k(b) - b} = \Psi(b)$$
 where  $\Psi(b)$  comprises the first value,  $b$  is a bid,  $\varphi_k(b)$  is the selected bidder's value distribution,  $k$  is an index identifying the selected bidder, and  $F(\varphi_k(b))$  is the probability value distribution for the selected bidder.

17. The storage medium of claim 15 wherein the instruction usable to determine the first parameter comprises an instruction usable to compute a ratio of an estimate of the density function to an estimate of the joint bid distribution.